

1           **TOOL SUSPENSION DEVICE HAVING A SEPARABLE TOOL**  
2           **BRACKET WITH OFFSET PARTING LINE AND A PLASTIC**  
3           **INJECTION MOLD ASSEMBLY FOR MAKING THE TOOL BRACKET**  
4           BACKGROUND OF THE INVENTION

5           **1. Field of the Invention**

6           The present invention relates to a tool suspension device, and more  
7           particularly to a tool suspension device has a separatable tool bracket with offset  
8           parting lines, and a plastic injection mold assembly for making the tool bracket.

9           **2. Description of Related Art**

10          With reference to Fig. 9, a conventional tool suspension device in  
11          accordance with prior art comprises a suspension board (50), a tool bracket (51)  
12          and fasteners (52). The suspension board (50) has a front (not numbered) and a  
13          bottom (not numbered). The tool bracket (51) is mounted detachably on the front  
14          of the suspension board (50) at the bottom and comprises a U-shaped body (not  
15          numbered) and two mounting feet (not numbered). The body has a longitudinal  
16          tool slot (511), a front (not numbered) and two opposite sides (not numbered).  
17          The mounting feet are formed respectively on and protrude respectively from the  
18          sides of the body. The fasteners (52) are attached respectively to the mounting  
19          feet to fasten the tool bracket (51) on the front of the suspension board (50).  
20          Therefore, a tool, such as a wrench (70) can be inserted into and held in the tool  
21          slot (511) for suspension.

22          Both the suspension board (50) and tool bracket (51) are made by plastic  
23          injection molding. The suspension board (50) and tool bracket (51) need separate  
24          mold sets. For custom specialty products, the front of the body of the tool bracket

1 (51) is molded with a product indicator (512), such as trademarks, significant  
2 symbols, characters, etc. to provide relevant product information about the tool  
3 suspension device.

4 With reference to Figs. 9 and 10, a plastic injection mold assembly (not  
5 numbered) in accordance with the prior art to make the tool bracket (51) with the  
6 front product indicator (512) is mounted on a mold base (60) and comprises a  
7 lower part (61) and an upper part (62). The lower part (61) is mounted on the  
8 mold base (60) and has a top (not numbered) and multiple cores (611) formed on  
9 the top. The cores (611) are arranged along two straight lines.

10 The upper part (62) is mounted detachably on the top of the lower part  
11 (61) and comprises a common mold (620) and two interchangeable molds (622).  
12 The common mold (620) has a top (not numbered), a bottom (not numbered),  
13 two channels (not numbered) and multiple cavities (621). The cavities (621) are  
14 defined in the bottom of the common mold (620) and correspond respectively to  
15 the cores (611). Each pair of corresponding cavity (621) and core (611)  
16 fabricates a tool bracket (51). The channels are defined in the top of the common  
17 mold (620) and are aligned respectively with the in-line cavities (621). Each of  
18 the cavities (621) has a bottom (not numbered), a molding surface (not numbered)  
19 and an opening (not numbered). The molding surface is used to shape the body  
20 of the tool bracket (51). The opening is defined through the bottom so that the  
21 cavities (621) communicate respectively with the channels.

22 The interchangeable molds (622) are mounted respectively in the  
23 channels and have multiple bottom protrusions (not numbered). The bottom  
24 protrusions are respectively fitted and held in the openings of the cavities (621)

1 and have respectively a parting surface (not numbered) flush with the bottom of  
2 the adjacent cavity (621). To make the product indicator (512) such as a string of  
3 Arabic numerals on the front of the body of the tool bracket (51) (e.g. 2004  
4 shown in Fig. 9), each parting surface has a marking portion (624) to mold the  
5 product indicator (512) on the front of the body of the tool bracket (51). The  
6 marking portion (624) may be indentations to form a solid product indicator (512)  
7 or protrusions to form an indented product indicator (512).

8 Therefore, when the contents of the product indicator (512) needs to be  
9 changed, only the interchangeable mold (622) has to be replaced with a new one,  
10 which will save cost of the mold assembly.

11 However, the described mold assembly causes a parting line (53) around  
12 the product indicator (512) on the front of the body of the tool bracket (51). The  
13 parting line (53) is formed during the injection molding along the interface of the  
14 opening in the bottom of each cavity (621). Improper location of the parting line  
15 (53) on the front of the body of the tool bracket (51) will effect the appearance of  
16 the tool bracket (51) and cause the front of the tool bracket (51) to be untidy.  
17 Therefore, the whole tool suspension device becomes unsightly.

18 In addition, defining the opening in the bottom of each of the cavities  
19 (621) forms an annular protrusion (623) that protrudes into the molding surface  
20 of the cavity (621). The annular protrusions (623) will restrict machining means  
21 for defining the cavities (621) in the common mold (620). Electric discharge  
22 machining (EDM) is the only way to define the cavities (621) except wire-cut  
23 electric discharge machining. Wire-cut machining cannot be used because of the  
24 annular protrusions (623). Electric discharge machining requires more time and

1 cost to define the cavities (621) than wire cutting machining does.

2 To overcome the shortcomings, the present invention provides an  
3 improved plastic injection mold assembly to make a separatable tool bracket  
4 with offset parting lines to mitigate or obviate the aforementioned problems.

5 **SUMMARY OF THE INVENTION**

6 The main objective of the invention is to provide a tool suspension  
7 device that has a separatable tool bracket with offset parting lines to make a front  
8 of the tool bracket clean and neat.

9 Another objective of the present invention is to provide a plastic  
10 injection mold assembly for making a tool bracket with offset parting lines  
11 where the injection mold assembly comprises a common mold and multiple  
12 interchangeable molds to reduce mold costs.

13 A mold assembly for making a tool bracket for a tool suspension device  
14 includes a lower part and an upper part. The lower part has multiple cores. The  
15 upper part is mounted detachably on the lower part and includes a common mold  
16 and multiple interchangeable molds. The common mold has multiple cavities  
17 corresponding respectively to the cores to simultaneously mold multiple tool  
18 brackets. Each of the cavities has a primary flat molding surface. The  
19 interchangeable molds are mounted detachably in the common mold and have  
20 multiple upper cavities aligned and communicating respectively with the cavities  
21 in the common mold. Each of the upper cavities has a bottom, a marking portion  
22 formed on the bottom and a secondary flat molding surface flush with the  
23 primary flat molding surface of the aligned cavity. Consequently, a tool bracket  
24 molded by the mold assembly has a front product indicator and an offset parting

1 line to make a front of the tool bracket clean.

2 Other objectives, advantages and novel features of the invention will  
3 become more apparent from the following detailed description when taken in  
4 conjunction with the accompanying drawings.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

6 Fig. 1 is an operational perspective view of a tool suspension device in  
7 accordance with the present invention;

8 Fig. 2 is a perspective view of a tool bracket of the tool suspension  
9 device in Fig. 1;

10 Fig. 3 is a side plan view in partial section of a mold assembly to make  
11 tool brackets in Fig. 2;

12 Fig. 4 is an enlarged cross sectional side plan view of a segment of an  
13 upper part of the mold assembly in Fig.3;

14 Fig. 5 is an operational side plan view in partial section of the mold  
15 assembly in Fig. 3 molding multiple tool brackets in Fig. 2;

16 Fig. 6 is a perspective view of an alternative embodiment of the tool  
17 bracket in accordance with the present invention;

18 Fig. 7 is an exploded perspective view of a second embodiment of the  
19 tool suspension device in accordance with the present invention;

20 Fig. 8 is an exploded perspective view of a third embodiment of the tool  
21 suspension device in accordance with the present invention;

22 Fig. 9 is a perspective view of a conventional tool suspension device in  
23 accordance with the prior art; and

24 Fig. 10 is an operational side plan view in partial section of a

1 conventional mold assembly in accordance with the prior art for making the tool  
2 bracket in Fig. 9.

3 DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

4 With reference to Figs. 1 and 2, a tool suspension device in accordance  
5 with the present invention comprises a suspension board (11), a tool bracket (10)  
6 and multiple fasteners (13). The suspension board (11) has a front (not  
7 numbered). The tool bracket (10) is attached demountably to the front of the  
8 suspension board (11) with the fasteners (13) and comprises a U-shaped body  
9 (not numbered) and two mounting feet (12). The body has a longitudinal tool slot  
10 (103), a front (not numbered), a top (not numbered), a bottom (not shown) and  
11 two opposite sides (not numbered). The tool slot (103) is defined from the top to  
12 the bottom to hold a tool, such as a wrench (not numbered). The mounting feet  
13 (12) extend respectively from the sides of the body to mount the tool bracket (10)  
14 on the front of the suspension board (11) with the fasteners (13).

15 With reference to Figs. 2 and 6, the tool bracket (10) has a product  
16 indicator (101) formed on the front of the body to provide some relevant product  
17 information about the tool suspension device. The product indicator (101) may  
18 be a trademark, company logo, useful characteristic, significant symbol, etc. and  
19 is molded on the front of the body of the tool bracket (10). For illustrative  
20 purposes only, the product indicator (101) on the tool bracket (10) in Figs. 1 and  
21 2 is 2004, and the product indicator (101) on the tool bracket (10') in Fig. 6 is  
22 2003. The tool brackets (10, 10') have respectively individual product indicators  
23 (101) to make them distinct from each other. Therefore, the tool suspension  
24 device may use different types of tool bracket (10, 10') for customer specialty

1 products.

2       With further reference to Figs. 3, 4 and 5, a plastic injection mold  
3 assembly (not numbered) for making the tool bracket (10) is mounted on a mold  
4 base (60) and comprises a lower part (61) and an upper part (20). The lower part  
5 (61) is mounted on the mold base (60) and has a top (not numbered) and multiple  
6 cores (611) formed on the top. The cores (611) are arranged in two straight lines.  
7 Each of the cores (611) is used to fabricate one tool bracket (10) so that the mold  
8 assembly forms simultaneously multiple tool brackets (51) at a time to improve  
9 efficiency. The quantity of the core (611) may be one, which means the mold  
10 assembly only forms one tool bracket (51) at a time.

11       The upper part (20) is mounted demountably on the top of the lower part  
12 (60) and comprises a common mold (200) and multiple interchangeable molds  
13 (202). The common mold (200) has a top (not numbered), a bottom (not  
14 numbered), multiple through cavities (201) and two channels (205). Each of the  
15 through cavities (201) is defined in the bottom of the common mold (200) and  
16 has a primary flat molding surface (not numbered). The through cavities (201)  
17 are arranged in two straight lines and correspond respectively to the in-line cores  
18 (611). An amount of the through cavities (201) corresponds to the amount of the  
19 cores (611). The channels (205) are defined in the top of the common mold (200)  
20 and are respectively aligned and communicated with the in-line through cavities  
21 (201).

22       The interchangeable molds (202) are mounted respectively in the  
23 channels (205) in the common mold (200), and each interchangeable mold (202)  
24 has a bottom (not numbered) and multiple upper cavities (203). The upper

1    cavities (203) are defined in the bottom of the interchangeable molds (202) and  
2    are respectively aligned with the corresponding through cavities (201). Each of  
3    the upper cavities (203) communicates with the aligned through cavity (201) in  
4    the common mold (200) and has a secondary flat molding surface (not  
5    numbered), a bottom (not numbered) and a marking portion (204). The  
6    secondary flat molding surface is flush with the primary flat molding surface of  
7    the through cavity (201) to avoid protrusions relative to the primary flat molding  
8    surface of the through cavity (201). The primary and the secondary flat molding  
9    surfaces are used to shape the body of the tool bracket (10) during the injection  
10   molding. The design of the primary flat molding surface of the through cavity  
11   (201) permits using wire-cutting machining to define the through cavities (201).  
12   Using wire-cutting machining is more effective and faster than electronic  
13   discharge machining to define the through cavities (201).

14        With reference to Figs. 2 and 5, the marking portion (204) is formed on  
15   the bottom of the upper cavity (203) to mold the product indicator (101) on the  
16   front of the body of the tool bracket (10). Since the secondary flat molding  
17   surface of the upper cavity (203) is flush with the primary flat molding surface of  
18   the through cavity (201), a continuous parting line (102) is formed along the  
19   interface between the interchangeable mold (202) and the common mold (200)  
20   on the top, the bottom and the sides of the body of the tool bracket (10).  
21   Consequently, the parting line (102) is not visible when a consumer faces the  
22   front of the tool suspension device. Therefore, the front of the body of the tool  
23   bracket (10) is clean and neat.

24        With reference to Figs. 1, 3 and 6, making the tool brackets (10, 10') with

1 different product indicators (101) only requires that the interchangeable molds  
2 (202) be replaced. Always using the common mold (200) of the upper part (20)  
3 of the mold assembly reduces the overall upper part (20) cost. The depth of the  
4 upper cavity (203) in the interchangeable mold (202) is not deep so only a short  
5 time is required for the electronic discharge machining to define the upper cavity  
6 (203).

7 With reference to Figs. 7 and 8, the tool suspension device in accordance  
8 with the present invention may comprise different types of tool brackets that are  
9 fastened respectively by different attaching means.

10 Even though numerous characteristics and advantages of the present  
11 invention have been set forth in the foregoing description, together with details  
12 of the structure and function of the invention, the disclosure is illustrative only,  
13 and changes may be made in detail, especially in matters of shape, size, and  
14 arrangement of parts within the scope of the appended claims.